## REMARKS

By this amendment, claims 1, 2 and 5 – 11, are pending in the application. Claim 5 has been amended to depend on claim 1 as opposed to canceled claim 3. The amended claim is fully supported by the originally filed specification and original claims, and adds no new matter.

**Rejection under 35 U.S.C. § 103**

1. The Examiner rejected claims 1-4, 6 and 9-10 under 35 U.S.C. § 103(a) as being unpatentable over Sasaki et al. (U.S. Patent No. 6,214,130) in view of Braton et al. (U.S. Patent No. 3,934,379).

To establish a *prima facie* case of obviousness under 35 U.S.C. 103:

(A) The claimed invention must be considered as a whole;

(B) The references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination;

(C) The references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention; and

(D) Reasonable expectation of success is the standard with which obviousness is determined. Hodosh v. Block Drug Co., Inc., 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir. 1986).

A determination of obviousness requires that the prior art references that are combined must teach or suggest all of the claim limitations. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Claim 1 is to a method of cleaning a surface of a substrate processing chamber component to remove process deposits on the component. The method comprises cooling the chamber component surface comprising the process deposits to a temperature below about -40°C by at least one of (i) immersing the surface in liquid

nitrogen, and (ii) spraying the surface with liquid nitrogen, thereby fracturing the process deposits on the surface.

As stated by the Examiner, "Sasaki et al fails to disclose immersing the surface in liquid nitrogen or spraying the surface with the liquid nitrogen or grit blasting or heating the surface after cooling or a texture surface." [Emphasis added.] However, the combination of Sasaki et al. and Braton et al. does not establish a *prima facie* case of obviousness because Braton et al. fails to make up for the deficiencies of Suzuki et al. as Braton et al. is non-analogous art and it is not obvious to combine Sasaki et al. with Braton et al. because there is no reasonable expectation of success in doing so.

> Two criteria have evolved for determining whether prior art is analogous: (1) whether the art is from the same field of endeavor, and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved. A reference is reasonably pertinent if it is one which, because of the matter with which it deals, logically would have commended itself to the inventor's attention in considering his problem. If a reference disclosure has the same purpose as the claimed invention, the reference relates to the same problem, however, if it is directed to a different purpose, the inventor would have accordingly have had less motivation or occasion to consider it. In re Clay, 23 USPQ 2d 1058, 1060-61 (Fed. Cir. 1992).

Whether Braton et al. is analogous art depends first on whether the art with respect to the Braton et al. invention is in the same field of endeavor as the invention in the present application. "The present invention relates to the cleaning of process deposits from substrate processing chamber components." (Specification, lines 5-6.) According to the Examiner, the Braton et al. "reference fails to clean a surface of a substrate processing chamber component." Thus, Braton et al. is not from the same field of endeavor as the present invention, namely fabrication of substrate such as semiconductor wafers and displays.

As the Braton et al. invention is not within the field of the Applicant's endeavor, the next question to be addressed is whether the reference is still reasonably pertinent to the particular problem with which Applicant is involved. Applicant addresses the problem of "...cleaning process deposits from substrate processing chamber components." (Specification, lines 5-6.) The Braton et al. reference is not reasonably pertinent because it would not have logically commended itself to the inventor's attention in considering his problem, because it deals with an industrial process to remove organic residues that build up in the application of surface finishes or surface treatments to parts (Col. 1, lines 11-25) instead of the cleaning of components used in the art of semiconductor fabrication. One of ordinary skill in the art would not consider an industrial cleaning process when addressing a cleaning process to be performed in the requisite clean room environment of a semiconductor fabrication room, because the of the vastly different requirements in the standard of cleanliness. Clearly, the Broderick et al. reference is non-analogous art and should not be applied in this rejection.

Furthermore, there is no suggestion or motivation to show desirability to make this combination of Sasaki et al. and Braton et al.. To establish a prima facie case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings and there must also be a reasonable expectation of success for such a combination. In re Vaeck, 947 F.2d 488 (Fed. Cir. 1991). See also MPEP § 2143 - § 2143.03 for decisions pertinent to each of these criteria.

There is no suggestion in Braton et al. to apply the process described in Braton et al. to remove process residues from a pipe in a semiconductor device fabricating machine to Sasaki et al.. Similarly, there is no suggestion in Sasaki et al. to apply its described gas cleaning processes to the industrial arts described by Braton et al. Instead, Sasaki et al. teaches away from Braton et al. and the current invention.

A reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant. In re Gurley, 31 USPQ 2d 1130, 1131 (Fed. Cir. 1994).

Sasaki et al. teaches:

If the pipe of the semiconductor device fabricating machine is heated while supplying the pipe with a cleaning gas composed by adding 1% to 5% of $O_2$ into a high-purity Ar, as shown in FIG. 1, an organic matter 2 adhered to an inner wall surface 1 of the pipe is continuously hit by Ar molecules 3, with the result that the organic matter 2 is blown off. (Sasaki et al., Col. 4, lines 29-35.)

Sasaki et al. teaches flowing gas through a pipe of a substrate fabrication machine to blow and dislodge organic matter from the inner surface of the pipe and flush it out of the machine while leaving the pipe assembled in place in the machine. In Sasaki et al.'s method, the pipe remains in the semiconductor fabrication machine and a gas is flown through the pipe to clean the inside of the pipe. However, flowing a cleaning gas through and/or over components in a substrate fabrication machine, such as a chamber, would blow the deposits removed from the component surfaces throughout the machine, allowing the deposits to redeposit and cause contamination in the machine.

Braton et al. teaches "[a] method for removal of layers of organic material built up on a support for articles during surface coating and treating comprising applying a liquefied inert gas to the support..." (Braton et al., Abstract.) Specifically, the removal process teaches "...immersing the support with the built up layers, in whole or in part, into a bath of liquefied gas....[and]...spraying the liquefied gas onto the built up layers and support." (Braton et al., Claims 4 and 9.) According to the method of Braton et al. and in contrast to Sasaki et al., the surface of the supports would have to be moved from their current locations or disassembled from other components that they may be attached to in order to be either immersed in the liquefied inert gas bath and/or sprayed by the liquefied gas. Thus, Sasaki et al. teaches away from Braton et al. and the current invention.

Thus, neither Sasaki et al. nor Braton et al., nor the combination of these two references teach or suggest the method of claim 1, which is to cleaning a surface of a substrate processing chamber component to remove process deposits therefrom. Thus, claim 1 and the claims depending therefrom, are patentable over Sasaki et al. in view of Barton et al.. The Applicant would like to draw the Examiner's attention to the fact that claims 3-4 were previously canceled.

2. The Examiner rejected claim 5 under 35 U.S.C. § 103(a) as being unpatentable over Sasaki et al. in view of Barton et al. as applied to claim 1, and further in view of Sakurai et al. (U.S. Patent No. 6,082,373).

Claim 5 is dependent on independent claim 1 and is therefore patentable over Sasaki et al. in view of Barton et al. for the reasons explicated above.

Sakurai et al. does not make up for the deficiencies of Sasaki et al. or Barton et al. because Sakurai et al. also does not teach application of liquid nitrogen to a component by immersion or spraying to cool the component to reach low temperatures of below about - 40°C, thereby fracturing process deposits on the component surface as claimed. Instead Sakurai et al. teaches a cleaning process in which oxygen is dissolved in aerated water and the component is contacted with the water while ultrasonic vibrations are applied. (Abstract.) Sakurai et al. further teaches that:

> It is preferred that the amount of oxygen dissolved into the pure water is 0.5 ppm or more. According to the oxygen dissolving methods (1) and (2), oxygen can be dissolved into pure water up to about 20 ppm at 25° C.(Sasaki et al., Col. 3, lines 16-19.)

Thus, Sakurai et al. teaches a cleaning process in which the component is maintained at temperatures of 25°C in aerated water. Sakurai et al. does not teach the claimed process of immersing a component in liquid nitrogen or spraying liquid nitrogen onto the

surface of the component to cool the component surface to low temperatures of -40°C, thereby fracturing the process deposits on the surface.

Sasaki et al. teaches applying nitrogen gas into a pipe within a semiconductor fabrication machine so that the nitrogen gas blows off the contaminant residues and teaches against application of a liquid to a component. Braton et al. is non-analogous art because Braton et al. is to an industrial process to remove organic residues that build up in the application of surface finishes or surface treatments to parts. Sakurai et al. teaches a cleaning process in which the component is maintained at temperatures of 25°C in aerated water. Thus, one of ordinary skill in the art would not have a reasonable expectation of success, or motivation, to employ the process taught by Sasaki et al., Barton et al., or Sakurai et al. to derive the claimed process of immersing a component in liquid nitrogen or spraying liquid nitrogen onto a component, to cool the component surface to low temperatures of below about -40°C, thereby causing process desposits to fracture and flake off from the component surface.

Thus, Applicant respectfully submits that claim 5 is patentable over the cited combination of Sasaki et al., Barton et al. and Sakurai et. al.. Accordingly, Applicant respectfully requests withdrawal of the rejection.

3. The Examiner rejected claims 6 and 7-8 under 35 U.S.C. §103(a) as being unpatentable over Sasaki et al. in view of Klee et al. (U.S. Patent No. 4,627,197).

Claims 6 and 7-8 are all dependent on claim 1. As explained above, Sasaki does not teach a method of cleaning a surface of a component to remove process deposits, comprising cooling the surface of the component to a temperature below about -40°C by immersing the surface in liquid nitrogen or spraying the surface with liquid nitrogen, thereby fracturing the process deposits on the surface of the component, as in claim 1.

Sasaki et al. teaches applying nitrogen gas into a pipe so that the nitrogen gas blows off the contaminant residues from the pipe sidewalls while they are subject to thermal stresses. In contrast, the present process comprises the steps of immersion of the substrate processing chamber component in liquid nitrogen, or spraying liquid nitrogen onto the surface of the component, to cause the component surface to reach low temperatures of below about -40°C, which causes the residue material to fracture and flake off from the component surface instead of being blown off by nitrogen gas. Thus, Sasaki et al. teaches applying nitrogen gas to the pipe in the semiconductor fabrication machine and does not teach immersing a component in a fluid or spraying a component with a fluid to reach low temperatures of - 40°C.

Klee et al. does not make up for the deficiencies of Sasaki et al. because Klee et al. is non-analogous art. Klee et al. teaches removing flash from molded articles and paint and other coatings. (Col. 1, lines 10-15.) Klee et al. is non-analogous art because it is not within the endeavor of the Applicant's invention, namely the art of semiconductor fabrication. Removing flash molding is an industrial factory process performed in an environment with much lower cleanliness standards than the requisite clean room environment of a semiconductor fabrication floor. One of ordinary skill would not seek knowledge from industrial factory processes to apply to semiconductor and display fabrication processes. Thus, Klee et al. should not be applied in this rejection as Klee et al. is non-analogous art.

Furthermore, for such a combination there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the teachings of the different references. There is no suggestion in Klee et al. to apply the process described to remove process residues in semiconductor fabrication. Similarly, there is not suggestion in Sasaki et al. to apply its described processes to the industrial arts described by Klee et al.

For these reasons, Applicant respectfully submits that a prima facie case of obviousness has not been established for claims 6-8 based on the cited combination of Sasaki et al. and Klee et al.. Accordingly, Applicant respectfully asserts that claims 6-8 are patentable over Sasaki et al. and Klee et al. and requests the withdrawl of the rejection.

4. The Examiner rejected claim 11 under 35 U.S.C. § 103(a) as being unpatentable over Sasaki et al. in view of Hatano (U.S. Patent No. 5,954,887).

Claim 11 is dependent on independent claim 1 which is patentable over Sasaki et al. for the reasons explained above. However, Hatano fails to make up for the deficiencies of Sasaki et al. because Hatano also does not teach a method of cleaning a surface of a substrate processing chamber component to remove process deposits, comprising cooling the surface of the component to a temperature below about -40°C by immersing the surface in liquid nitrogen or spraying the surface with liquid nitrogen, thereby fracturing the process deposits on the surface of the component, as in claim 1. Instead, Hatono teaches a cleaning process in which "...$TiCl_4$ gas is introduced by means of a carrier gas, to remove unnecessary Ti films sticking to the inside of the film forming apparatus." (Hatano, Abstract.) Thus, Hatona does not teach the claimed process of immersing a component surface in liquid nitrogen or spraying liquid nitrogen onto the component to cool the component surface to low temperatures of below about -40°C, thereby causing residue material to fracture and flake off from the component surface.

As Sasaki et al. teaches applying nitrogen gas into a pipe so that the nitrogen gas blows off the contaminant residues from the pipe sidewalls while they are subject to thermal stresses and Hatona teaches a cleaning process in which a $TiCl_4$ gas is supplied to a chamber, one of ordinary skill in the art would not have a reasonable expectation of success to employ the process taught by Sasaki et al. or Hatona to derive the claimed process of immersing a component in liquid nitrogen or spraying

liquid nitrogen onto the surface to the component, to cool the component surface to low temperatures of below about -40°C, thereby causing residue material to fracture and flake off from the component surface.

For these reasons, Applicant respectfully submits that claim 11 is patentable over the cited combination of Sasaki et al. and Hatona. Accordingly, Applicant respectfully requests withdrawal of the rejection and allowance of the present claims.

The above-discussed amendments are believed to place the present application in condition for allowance. Should the Examiner have any questions regarding the above remarks, the Examiner is requested to telephone Applicant's representative at the number listed below.

Respectfully submitted,
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